

Home Microscope

Instruction Manual for
MI-4100STD – Home Microscope
MI-4100DHD – Home Dual-Head Microscope
MI-4100SPL – Home Iris Diaphragm
Microscope
MI-4100DXL – Home 1000x Microscope

The logo for Home Science Tools features the words "HOME SCIENCE TOOLS" in a bold, sans-serif font. Above the letter "I" in "SCIENCE" are two small circles, resembling a microscope lens or a pair of eyes. Below the main text, the tagline "THE GATEWAY TO DISCOVERY" is written in a smaller, all-caps font.

HOME SCIENCE TOOLS
THE GATEWAY TO DISCOVERY

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Welcome to an exciting world of discovery with your new Home Microscope!

This manual will give you a familiarity with the different features on your microscope, how to use them, and how to preserve your investment by proper maintenance and care.

There are four microscopes in the Home 4100 series. Pages 2-4 will cover the basic features and functions of the MI-4100STD model, most of which are common to all three microscopes.


The small microscope icon  indicates a feature that is upgraded on the Home Dual-Head (MI-4100DHD), the Home Iris Diaphragm (MI-4100SPL) and/or the Home 1000x (MI-4100DXL) microscopes. To learn about the upgraded features and their uses, turn to pages 4-6.

Table of Contents

General Microscope Care 2
 Unpacking..... 2
 Cleaning 2
 Features & Definitions..... 2
 Microscope Diagram..... 2
 Description of Components 3
 Installing a Mechanical Stage..... 4
 Operating Procedure..... 4
 MI-4100DHD Model 4
 Features for MI-4100SPL/DXL..... 5
 1.25 Abbe Condenser..... 5
 Iris Diaphragm 5
 100x Oil Immersion Objective 5
 Mechanical Stage 5
 Filters 6
 Maintenance..... 6
 Adjusting the Stage Stop..... 6
 Changing the Bulb 6
 Adjusting Tension 7
 Troubleshooting **Error! Bookmark not defined.**
 Specifications 8
 Warranty 8

General Microscope Care

Unpacking

The Home microscopes are shipped in a two-part Styrofoam case. Keep this case for storage, transport, and shipping. It is perfect packing material should you ever need to send your microscope in for repairs covered by the warranty.

When handling your microscope, always pick it up by the arm. Avoid touching the lens surfaces on the eyepiece or objective lenses, as finger prints will decrease image quality.

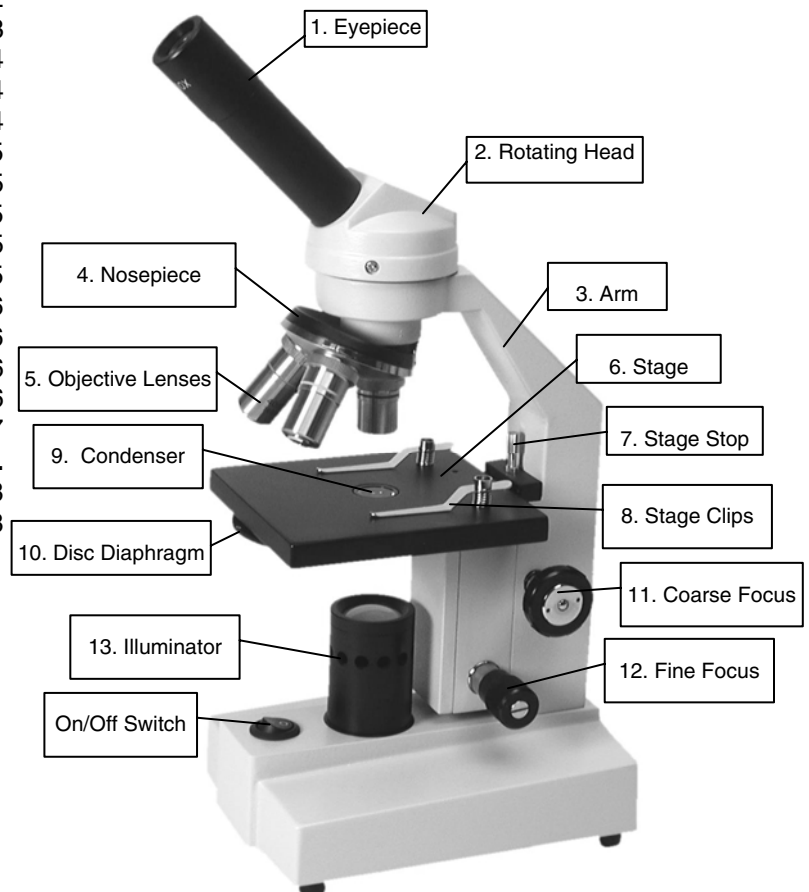
Cleaning

The best optical quality can be compromised by dirty lenses. Using a dustcover and cleaning the lenses regularly will greatly enhance your microscope use.






To clean lens surfaces, remove dust by using a soft brush or a can of compressed air. Then moisten a piece of lens paper (our item MI-PAPER) with some lens cleaning solution (MI-LENSCLN). Gently clean the eyepiece, objective lens exterior surface, and condenser using a circular motion. Repeat with a second paper moistened with solution if necessary. Repeat once again with a piece of dry lens paper until the lens is clean and dry. **Do not spray lens cleaner directly on the lens.**

Features & Definitions

Microscope Diagram



Description of Components

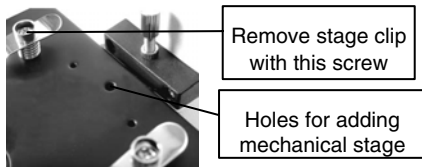
-  **Eyepiece:** This is the part of the microscope that you look through. It is inclined at a 45° angle for comfortable viewing. It contains a lens that magnifies 10x. The 4100DHD model has an additional teaching eyepiece; see p. 4 for a description.
- Rotating head:** The head rotates 360° so that multiple users can look in the eyepiece comfortably without moving the microscope itself.
- Arm:** The arm not only supports the head and nosepiece; it is also the best “handle” for picking up and moving the microscope.
- Nosepiece:** This is also called the “objective turret.” It holds the objective lenses and rotates 360°. You can change magnification by turning it until the lens you want to use “clicks” into place.
-  **Objective Lenses:** These are the lenses closest to the specimen. The standard objectives are 4x, 10x, and 40x, which multiply with the 10x eyepiece lens to provide magnification levels of 40x, 100x, and 400x. The 4100DLX model also includes a 100x objective for 1000x magnification. The shortest lens has the lowest magnification level, while the longest has the highest. The objectives have the following characteristics:
 - They are *DIN* – they meet an international standard of optical quality.
 - They are *achromatic* – they help prevent color distortion.
 - They are *parcentered* – if you center your slide using one objective, it will still be centered when you move to another objective.
 - They are *parfocal* – if you focus your specimen using one objective, it will stay coarsely focused when you move to another objective (you will still have to adjust the fine focus).
 - The 40x and 100x objectives are *retractable* – the tip containing the lens is spring-loaded to prevent damage to the objective or slide.
- The 100x objective is *oil immersion* – This is described on page 5.
- Stage:** The stage is the platform that supports the specimen slide below the objective lenses. It moves up and down when you turn the focus knobs, allowing you to get just the right distance between the slide and the lens.
- Stage stop:** This is a screw with a lock nut located between the stage and the arm of the microscope. It prevents the stage from coming too far up and grinding against the objective lenses. It is also called a “safety rack stop,” and is pre-adjusted by the manufacturer. Instructions for readjusting it manually are on page 6.
-  **Stage clips:** The stage clips hold the microscope slide in place. Pressing on the end closest to the arm of the scope will lift up the other end allowing you to place your slide underneath. The stage clips can be replaced by an optional mechanical stage on the MI-4100STD and MI-4100SPL models. See instructions for doing this on page 4.
-  **Condenser:** This lens in the center of the stage condenses and focuses the light rays from the illuminator to provide better image resolution.
-  **Disc diaphragm:** The diaphragm controls the amount of light coming through the specimen in order to provide optimum resolution for the objective lens. The diaphragm on the MI-4100STD model is a rotating disc under the stage with various-sized holes. The smaller holes should be used for lower magnification and the larger holes for higher magnification.
- Coarse focus:** The large coarse focus knob is used to raise or lower the stage until the image is in focus. The focus mechanism uses a slip clutch to prevent damage to the gears.
- Fine focus:** The smaller fine focus knob allows more precise image resolving after the image has been brought into focus with the coarse focus knob.
- Illuminator:** The illuminator provides necessary light underneath the stage. It contains a cool, bright, 5-watt fluorescent bulb. Instructions for changing the bulb are on page 6.

Installing a Mechanical Stage

The MI-4100STD and 4100-SPL models come pre-drilled for the addition of an optional mechanical stage (our item MI-MESTAGE). This added feature gives precise slide control for optimal viewing.

To install the mechanical stage follow these steps:

1. Remove the stage clips with a Phillips #2 screwdriver. The clips are screwed in tightly, so be careful not to strip the screw heads.
2. The mechanical stage attaches to the three holes that are located between the stage clips. The two pins on the bottom of the



mechanical stage fit into the smaller holes on each side of the threaded hole in the center. Align the pins with these holes and seat the mechanical stage firmly against the microscope stage.

3. Secure the mechanical stage to the microscope stage by tightening the center setscrew securely into the center (threaded) hole.

Operating Procedure

Now that you have an overview of what each component on your microscope is for, you can follow this step-by-step procedure to help you get started using it.

1. Set the microscope on a tabletop or other flat sturdy surface where you will have plenty of room to work. Plug the power cord into an outlet, making sure that the excess cord is out of the way so no one can trip over it or pull it off of the table.
2. Flip the switch to turn on your microscope's light source and then turn the disc diaphragm to the largest hole, which allows the greatest amount of light through. The holes are numbered; number 5 is the largest. You will see the number on the part of the disc that is visible beyond the edge of the stage.




3. Rotate the nosepiece to the lowest-power (4x) objective. You will hear a click when it is properly in place. Always start with the lowest power: it is easiest to scan a slide at a low setting, as you have a larger field of view.
4. Turn the coarse focus knob to move the stage down (away) from the objective lens as far as possible.
5. Set a microscope slide (coverslip facing up) in place under the stage clips. A prepared slide works best when you do this for the first time. (If you do not have a prepared slide, place a strand of colored yarn or thread on a blank slide and place a coverslip over it.) Move the slide until the specimen is under the objective lens.
6. Adjust the larger coarse focus knob until the specimen is in focus. Slowly move the slide to center the specimen under the lens, if necessary, by nudging it with your fingers.
7. Adjust the small fine focus knob until the specimen is clearly in focus. Then adjust the diaphragm to get the best lighting. Start with the most light and gradually lessen it until the specimen image has clear, sharp contrast.
8. Scan the slide (right to left and top to bottom) at low power to get an overview of the specimen (nudge the slide very slowly with your fingers). Then center the part of the specimen you want to view at higher power.
9. Rotate the nosepiece to the 10x for 100x magnification. Refocus using the fine focus knob and view your specimen carefully. Adjust the diaphragm again until the image has the best contrast. Repeat with the 40x objective for 400x magnification.

MI-4100DHD Model

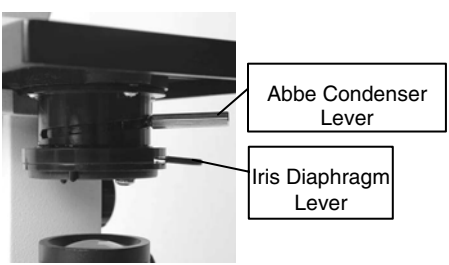
The MI-4100DHD model comes with a dual teaching head. In addition to a 30° inclined eyepiece, it has a vertical eyepiece that can be used for simultaneous viewing or digital camera photography. The vertical eyepiece is equipped with a diopter, which is used to adjust for focusing differences between the two people using the different eyepieces. Have the person using the inclined eyepiece focus the microscope. Then have the person using the vertical eyepiece rotate the diopter adjustment (the knurled band) until the specimen is also in focus for his or her eyes.

Features for MI-4100SPL/DXL

These two models have several upgrades from the MI-4100STD, as indicated in the previous pages by the  symbol. This section describes each feature and how it is used.

1.25 Abbe Condenser

Unlike the fixed condenser on the MI-4100STD model, this condenser on the 4100SPL or 4100DXL models is movable. Rotate it using the upper lever under the stage. Moving it clockwise will lower it; counter-clockwise will raise it. In most cases it can be left all the way up, though it may need adjustment when you use a 100x objective lens to achieve a clear image.



Iris Diaphragm

The iris diaphragm replaces the disc diaphragm on the 4100SPL and 4100DXL models. It provides greater control of the amount of light coming through the specimen and optics, and thus gives you more precise resolution and contrast for each specimen. The diaphragm adjusts very easily with a sliding control lever instead of a rotating disk. This lever is the lower lever under the stage.

Begin looking at any specimen with the iris diaphragm all the way open (clockwise is open, counter-clockwise is closed). After focusing, reduce the light by moving the lower lever until the specimen is in sharp, clear contrast. As with the disc diaphragm, you will need less light on lower power and more light on higher power. The following table gives suggested opening sizes for each power level:

Objective	Diaphragm Opening
4x	From fully closed to 1/8 open
10x	1/8 to 1/4 open
40x	1/4 to 1/2 open
100x	1/2 to 3/4 open

100x Oil Immersion Objective

The MI-4100DXL model has an additional 100x objective that provides 1000x magnification. At this magnification it is important to reduce light diffraction to enhance

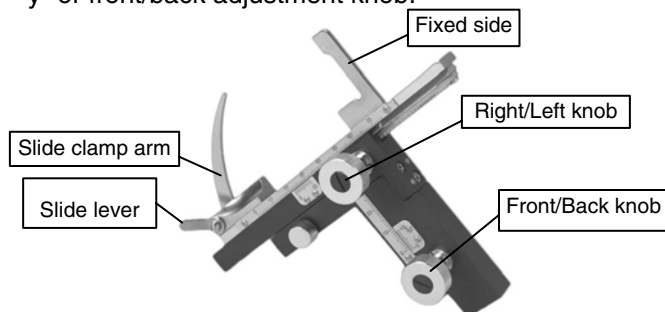
the image quality. This is done by using immersion oil according to the following steps:

1. Lower the stage using the coarse focus knob.
2. Raise the Abbe Condenser to the upright position by turning its lever counter-clockwise. Open the iris diaphragm by turning its lever clockwise.
3. Place one drop of high quality immersion oil (our item MI-IMMOIL) on top of the coverslip. (In some cases, it may be beneficial to place a drop of oil between the condenser and the slide also, but this is usually not necessary for a good image.)
4. Move the 100x objective lens into position, and then slowly move the stage up until the lens makes contact with the oil.
5. Continue focusing with the coarse knob until the color or blurred outline of the specimen appears. Finish focusing with the fine focus knob.
6. Adjust the condenser and diaphragm until you see the specimen in clear, sharp contrast.
7. When you are done, clean all the oil off the lenses and slides using lens paper and lens cleaning solution (instructions are on page 2 of this manual).



Mechanical Stage

The MI-4100DXL model has a mechanical stage, a component that allows precise movement of the slide on the stage while maintaining relatively good focus. It is ideal for scanning specimens. The mechanical stage has three operating components: the slide clamp arm, the "x" or right/left adjustment knob and the "y" or front/back adjustment knob.



1. Move the small lever on top of the stage to open the curved slide clamp arm.

- Carefully place the slide squarely against the fixed side and back edge of the mechanical stage. Make sure the slide lies flat on the microscope stage.
- Gently release the small lever allowing the slide clamp arm to securely hold the specimen slide in place. (Note: Releasing the slide clamping arm quickly may chip or break the specimen slide.)
- Move the specimen under the objective lens by turning the adjustment knobs. The front/back adjustment knob is closest to the arm of the microscope. It allows precise movement to the front and back of the stage. The right/left adjustment knob is furthest from the arm of the microscope. It allows precise movement to the right and left of the stage. Turn these adjustment knobs without putting any pressure on the stage. This will allow you to scan a slide while maintaining fairly good focus.

Filters

The MI-4100SPL and 4100DXL models come with a blue filter that can be placed in the filter holder located below the iris diaphragm. The filter absorbs some of the light from the illuminator and makes the light slightly blue. In some cases this may enhance the image of your specimen, though generally it is not necessary. Use the following procedure to insert the filter:



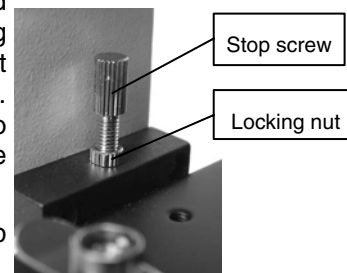
- Underneath the iris diaphragm there is a tiny filter holder knob. Use this to swing the filter holder out from under the diaphragm.
- Place the filter in the holder, and swing back into place.
- Adjust focus and diaphragm normally.

Maintenance

Adjusting the Stage Stop

The stage stop is set at the factory to insure that the stage cannot come up far enough to hit the objective lenses. In normal circumstances you will not have to adjust this. However, if it falls out of adjustment or you are using a thinner slide that cannot be focused, follow these steps:

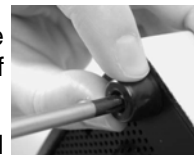
- Loosen the round knurled locking nut by turning it counter-clockwise. You may need to use needle-nose pliers for this.
- Loosen the stop screw.
- Focus on a standard slide until you obtain a sharp image.
- Tighten the stop screw by turning it clockwise until it stops, then turn it back ½ turn.
- Lock into position by tightening the locking nut.
- Note: The higher the stop screw is, the higher the stage will rise.



Changing the Bulb

Your microscope bulb should last for years—approximately 8000 hours. When it burns out, follow these steps for replacing it:

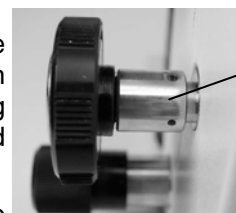
- Obtain the correct 5-watt fluorescent replacement bulb (our item MI-BULB4. Note: some other 5-watt fluorescent bulbs may be too big).
- Unplug your microscope from the power supply and allow it to cool before replacing the bulb.
- Carefully lay the microscope on its side.
- Using a screwdriver, remove the screw from the center of each rubber foot.
- Remove the perforated metal plate and gently pull the bulb straight out from the socket.
- Replace with a new bulb, then put the perforated metal plate back in place and replace the rubber feet.



Adjusting Tension

Coarse focus tension is pre-adjusted by the manufacturer, but if it falls out of adjustment, the stage will drift down under its own weight and the image will move out of focus. The tension adjustment collar is located between the microscope arm and the coarse focus knob on the right side (when the stage is facing you). To adjust the tension, follow these steps.

1. To tighten tension, turn the collar clockwise (you can get a better grip by putting a wide rubber band around the collar).
2. Tighten only enough to keep the stage from drifting downward



Tension collar

Troubleshooting

If you are experiencing difficulty with your microscope, try these troubleshooting techniques:

Problem	Possible Reason and Solution
Light fails to operate	<ol style="list-style-type: none"> 1. The AC power cord is not connected. <i>Connect the cord to an outlet.</i> 2. The bulb is burned out. <i>Replace the bulb. (See "Changing the Bulb," p. 6.)</i> 3. The power source outlet is inoperative. <i>Have a qualified electrician repair the outlet.</i> 4. The incorrect bulb is installed. <i>Replace with the correct bulb.</i>
Light flickers	<ol style="list-style-type: none"> 1. The bulb is not properly inserted into the socket. <i>Properly insert the bulb.</i> 2. The bulb is about to burn out. <i>Replace the bulb.</i> 3. The connection at the AC outlet is loose. <i>Have a qualified electrician repair the outlet.</i> <p>Note: The fluorescent bulb typically flickers for 10 to 15 seconds when first turned on. This is normal.</p>
No image	<ol style="list-style-type: none"> 1. The nosepiece is not indexed properly. <i>Move revolving nosepiece until the objective lens clicks into position.</i> 2. The light is too bright. <i>Adjust the diaphragm.</i>
Unable to focus slide	<ol style="list-style-type: none"> 1. The slide coverslip is too thick. <i>Use 0.17 mm thick (No. 1) coverslip.</i> 2. The stage drops under its own weight. <i>Adjust tension of coarse focus knob. (See "Adjusting Tension," p. 6.)</i> 3. The slide is upside down. <i>Place the slide on the stage with the coverslip facing up.</i> 4. The stage stop is not set at the proper position. <i>Adjust the stage stop. (See "Adjusting the Stage Stop," p. 6.)</i>
Poor resolution, image not sharp	<ol style="list-style-type: none"> 1. The condenser, objective, or eyepiece lenses are dirty. <i>Clean the lenses. (See "Cleaning," p. 2.)</i> 2. There is too much light. <i>Adjust the diaphragm.</i>

Spots in field	<ol style="list-style-type: none"> 1. The condenser, objective, or eyepiece lenses are dirty. <i>Clean the lenses. (See "Cleaning," p. 2.)</i> 2. The specimen slide is dirty. <i>Clean the slide.</i>
Uneven illumination of field	<ol style="list-style-type: none"> 1. The nosepiece is not indexed properly. <i>Move revolving nosepiece until the objective lens clicks into position.</i> 2. The diaphragm is not properly indexed. <i>Adjust the diaphragm to the proper level.</i>

Specifications

Eyepiece	Widefield 10x with 18mm exit pupil and fully coated optics.
Head	Monocular, 45° inclined head rotates 360°. MI-4100DHD has dual head: one 30° inclined eyepiece, one vertical eyepiece with diopter.
Nosepiece	3-hole or 4-hole nosepiece is ball-bearing mounted with positive click stops.
Objectives	<p>All objectives are DIN achromatic, parfocalled, parcentered, and fully coated.</p> <ul style="list-style-type: none"> • 4x, 0.10 N.A., red ring, 4.5mm field of view, 40x magnification • 10x, 0.25 N.A., yellow ring, 1.8mm field of view, 100x magnification • 40xR, 0.65 N.A., blue ring, 0.45mm field of view, 400x magnification, retractable • 100xR, 1.25 N.A., white ring, 0.18mm field of view, 1000x magnification, retractable, oil immersion (model MI-4100DXL only)
Focusing	Separate low position coarse and fine focusing controls with slip clutch, tension adjustment, and precise 0.002mm fine focus division.
Focus Rack	All metal rack-and-pinion focusing with adjustable stage stop.
Stage	Acid and chemical resistant 110 x 120mm metal stage with stage clips and predrilled for an optional mechanical stage.
Mechanical Stage	Top-position x-y controls provide precise 60mm movement on the x-axis and 30mm movement on the y-axis (Model MI-4100DXL only).
Condenser	Fixed 0.65 NA condenser on model MI-4100STD. Adjustable 1.25 Abbe condenser on models MI-4100SPL and MI-4100DXL.
Diaphragm	Calibrated 5-hole disc diaphragm on model MI-4100STD. Iris diaphragm with 2mm to 30mm diameter opening on models MI-4100SPL and MI-4100DXL.
Illuminator	5-watt fluorescent illuminator with grounded 110 volt cord.

Warranty

Home Science Tools warrants this microscope to be free from defects in material and workmanship under normal use and service for the life of the instrument. This warranty does not cover light bulbs, batteries, or damage due to misuse, abuse, alterations, or accident. Warranty does not cover lenses that have become inoperable due to excessive dirtiness as a result of misuse or lack of normal maintenance. Any cameras and software supplied with this microscope are warranted for one year from the date of purchase.

You will need to return your microscope freight prepaid for warranty service to Home Science Tools, or the repair facility we designate. We will repair or replace your microscope at no charge and return it freight prepaid to you. Please call 1-800-860-6272 to arrange warranty service before returning this instrument.

Please note that warranties apply only to the original purchaser and are not transferable.